

LEVERAGING DIGITAL EDUCATION TO DRIVE TRANSFORMATION AND SUSTAINABLE DEVELOPMENT IN NORTH CENTRAL NIGERIA

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Abstract

Digital education is increasingly recognised as a catalyst for educational transformation and sustainable development, especially in developing countries like Nigeria. This paper essentially examines the state of digital education in Nigeria and its potential to drive inclusive learning, social equity, and the attainment of the Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education) and SDG 9 (Industry, Innovation, and Infrastructure). Despite the growing importance of digital technologies, infrastructural and technological barriers persist. According to the National Bureau of Statistics, only 17% of households with school-aged children in Nigeria have access to a digital learning device, while the UNESCO Global Education Monitoring Report indicates that 43% of schools lack reliable electricity and only 26% of learners have internet access at home. Moreover, a World Bank study has revealed that only 29% of teachers across the country have received formal training in digital pedagogy. These figures expose a significant digital divide that undermines educational equity and quality. However, innovative interventions, such as mobile learning hubs, radio/TV school broadcasts, and localized e-learning platforms, have shown promise in bridging these gaps. This paper proposes a multidimensional strategy that includes infrastructure investment, teacher capacity building, and inclusive digital policy frameworks to ensure no learner is left behind. By leveraging digital education effectively, Nigeria can transform its education system into a more resilient, inclusive, and sustainable model for future generations.

Keywords: Digital Education, Sustainable Development, Nigeria, Educational Transformation, Digital Divide.

Introduction

Education is widely recognized as a critical driver of transformation, social stability, and economic development. In today's digital economy, technology-enhanced learning has become indispensable for promoting inclusivity, equity, and lifelong learning, aligning with Sustainable Development Goals such as SDG 4 (Quality Education) and SDG 9 (Innovation and Infrastructure) (United Nations, 2015; UNESCO, 2023). Globally, digital platforms are closing learning gaps, fostering innovation in pedagogy, and equipping learners with skills required in dynamic labour markets. However, Nigeria's North-Central zone faces acute barriers to educational transformation. Poor ICT infrastructure, limited internet penetration, unreliable

electricity, and low digital device ownership constrain adoption. For example, only 17% of households with school-aged children own digital learning devices (NBS, 2022), and 43% of schools lack reliable electricity (UNESCO, 2023). Teacher capacity remains limited, with just 31% trained in ICT pedagogy (World Bank, 2023). Conflict further compounds these challenges. In Benue State, recurrent farmer–herder clashes have displaced thousands, destroyed schools, and disrupted learning processes (IDMC, 2024). The resulting agricultural crisis, Benue being Nigeria’s “food basket”, has reduced household incomes, weakening support for children’s education (FAO, 2023). The nexus of insecurity, poverty, and infrastructural gaps underscores the urgency of digital interventions.

Digital education presents opportunities to build resilience by enabling displaced learners’ access, equipping teachers with digital pedagogy, and supporting agricultural modernisation. While Nigeria’s National Policy on ICT in Education (FME, 2021) seeks integration, uneven implementation persists, especially in underserved regions. Aligning digital education with food security, youth empowerment, and peacebuilding can advance SDGs 2, 4, 8, and 16, positioning education as a catalyst for sustainable development and inclusive growth (UNICEF, 2023; OECD, 2022; Adebayo & Olanrewaju, 2022). The intersection of digital education, educational transformation, and sustainable development has become a focal point of contemporary educational discourse, particularly in contexts affected by infrastructural challenges, conflict, and socio-economic disparities. Digital education offers innovative pathways for improving access, quality, and relevance of learning, aligning with global commitments such as the Sustainable Development Goals (SDGs) (UNESCO, 2022). In Nigeria, especially in the North-Central zone, the integration of digital tools into education is constrained by poor ICT infrastructure, electricity shortages, and conflict-induced disruptions (Okonkwo & Adebayo, 2022; World Bank, 2022). This review synthesises conceptual and theoretical perspectives relevant to understanding how digital education can catalyse transformation and sustainable development.

i) Conceptual Review of Literature: Digital learning has evolved from early computer-assisted instruction and distance education to the more interactive, network-based approaches enabled by internet expansion in the 1990s and 2000s (Bates, 2015). Learning Management Systems, grounded in constructivist paradigms, promoted active and collaborative learning (Anderson, 2008), while connectivism reframed learning as building networks of people and information (Siemens, 2005). The rise of MOOCs in 2012 widened global access (Hollands & Tirthali, 2014), while recent advances in mobile learning, AI personalization, XR/VR, and micro-credentials have diversified lifelong learning pathways (UNESCO, 2023).

Universally, digital learning is now prioritized as a lever for SDG 4 and resilient education systems able to withstand shocks such as pandemics and conflicts (UNESCO, 2022). Policy trends stress digital inclusion, teacher competence, open resources, and data-informed improvement (OECD, 2022). Beyond education, digital skills support employability, entrepreneurship, food systems, and health literacy (FAO, 2022; WHO, 2022).

Nigeria has adopted frameworks such as the National Policy on ICT in Education and the National Digital Economy Policy and Strategy to integrate ICT into curricula, teacher development, and school systems (FME, 2021; NITDA, 2023). Implementation includes blended and mobile pilots, broadcast learning, and university LMS, yet persistent gaps in power, connectivity, device access, and teacher readiness remain (World Bank, 2022; UNESCO, 2023).

In the North Central zone, conflict and displacement disrupt education, but the region’s agricultural base presents opportunities for digital agriculture and youth agritech entrepreneurship (IDMC, 2024; FAO, 2023). Community initiatives sustain access but require amplification through digital modalities (UNICEF, 2023). Literature converges on the need to

leverage digital learning now, for livelihoods, inclusive education, food and health security, and peacebuilding.

Global Evidence: Empirical research highlights that effective digital education depends on robust infrastructure, affordable devices, and teacher capacity. In developed economies, such as Finland, records shows over 95% school connectivity and one device per learner, enabling blended and personalized instruction (European Commission, 2022). Singapore's Smart Nation initiative combines 4G/5G coverage, universal device access, and teacher upskilling, yielding strong performance in digital literacy assessments (World Bank, 2022). In Africa, Rwanda's One Laptop per Child and Kenya's Digital Literacy Project improved device penetration but faced sustainability issues linked to weak infrastructure (Munyua et al., 2021). Comparatively, developed economies like Finland, Singapore have internet penetration of 95%, 98% with device ownership of 1:1 ratio, 100% laboratory penetration and 98%, 95% of teachers trained respectively.

b. Nigerian Evidence: In Nigeria, infrastructural and pedagogical gaps significantly constrain digital education. National internet penetration stands at 43%, but rural coverage falls below 20% (NBS, 2023). Only 35% of schools in the North-Central zone operate ICT laboratories, while just 28% of teachers have formal digital pedagogy training (FRN, 2022). Frequent power outages, averaging 32 hours weekly in rural areas, further disrupt learning (World Bank, 2023). Sub-national data underscores stark disparities, with urban centres like Lagos far ahead of conflict-prone states such as Benue, Nasarawa, and Plateau.

c. Pedagogical Implications: Evidence shows that technology alone does not drive learning; pedagogy does (Evans & Popova, 2015). Interventions that combine structured lesson supports, teacher coaching, and formative feedback enhance outcomes (Piper et al., 2022). Nigerian state-level reforms such as EdoBEST illustrate that integrating digital lesson guides with teacher mentoring and low-bandwidth delivery improves student achievement (World Bank; UNICEF evaluations). Thus, continuous professional development in digital pedagogy remains a high-leverage investment. Comparatively, some the key indicators such as internet penetration show global average of 67% with Sub Saharan Africa and Nigeria averaging between 36-39%, 30-35% respectively, with household ownership in Sub Saharan Africa, Nigeria and North Central fluctuating between 57%, 60% and 50% respectively. While schools with reliable electricity indicates a global average of 49% compared with Africa, Nigeria average of 19, 17% and North Centra's range of 12-18% respectively. Other indicators that shows the country and North Central zones backwardness and the potential for digital breakthrough Households with internet access, teachers with normal ICT training, dominant learner device, typical data cost and affordability.

Despite global advances, Nigerian studies are largely national in scope, obscuring regional inequalities. Few works explored the intersection of digital education with conflict, displacement, and peacebuilding, particularly in the North-Central zone (Ezeanya-Esiobu, 2022; UNICEF, 2023). Little is documented on grassroots resilience models, such as community ICT hubs for displaced learners. This study addresses these gaps by generating zone-specific evidence, assessing conflict impacts, and linking digital education with broader development priorities in agriculture, livelihoods, and peacebuilding.

This study draws on Connectivism (Siemens, 2005), Diffusion of Innovations Theory (Rogers, 2003), and Technology Acceptance Model (TAM) (Davis, 1989) as relevant frameworks for understanding digital education adoption. Connectivism emphasizes networked learning through digital platforms; Diffusion of Innovations explains how technologies spread across social systems; while TAM highlights user perceptions of ease and usefulness.

The study adopts Connectivism as the preferred framework because: (1) it aligns with digital, networked, and mobile learning realities; (2) it supports collaborative, inclusive, and adaptive

learning in conflict-prone contexts; and (3) it directly links knowledge acquisition to sustainable development goals.

Statement of the Problem

Nigeria's drive toward sustainable development is strongly tied to transforming its education sector in line with the demands of the digital age. Limited electricity, poor internet connectivity, and lack of digital devices deepen the digital divide, particularly in rural and conflict-prone areas, while insecurity and displacement disrupt learning. Furthermore, the region's vast agricultural potential remains underutilized due to weak capacity in digital and technical education. Without urgent interventions, the zone risks further marginalization in achieving youth capacities enhancement, reliable livelihood income and SDG 4, 8, 16 goals including inclusive and equitable lifelong quality education, decent work and economic growth as well as peace, justice and strong institutions achievable by leveraging digital education to drive transformation and sustainable development in North Central Nigeria

Objectives of the Study

The overall aim of this study was to examine the role of digital education in driving transformation and sustainable development in Nigeria, with a focus on addressing the socio-economic and conflict-related challenges affecting the North-Central zone. In particular, the study seeks to:

1. Assess the current state of digital education infrastructure in Nigeria, particularly in the North-Central zone, in relation to ICT facilities, electricity supply, internet connectivity, and access to digital devices
2. Evaluate the link between digital education and agricultural transformation, with emphasis on leveraging ICT to improve food security, enhance agricultural productivity, and support household incomes.
3. Investigate the potential of digital education in peacebuilding and conflict prevention, particularly in promoting peace education, accommodating conflict-displaced learners, and fostering resilience in affected communities.
4. Identify strategies to enhance youth and stakeholder capacities for deploying digital tools and resources towards education transformation, livelihood improvement, and sustainable development.

Research Questions

The following research questions will guide a investigations for conducting the research.

1. What is the current state of digital education infrastructure in Nigeria, particularly in the North-Central zone, regarding ICT facilities, electricity supply, internet connectivity, and access to digital devices?
2. How does digital education link to agricultural transformation in terms of leveraging ICT to improve food security, enhance agricultural productivity, and support household incomes?
3. What is the potential of digital education in peace-building and conflict prevention, specifically concerning the promotion of peace education, accommodation of conflict-displaced learners, and fostering of resilience in affected communities?
4. What strategies can be identified to enhance youth and stakeholder capacities for deploying digital tools and resources toward educational transformation, livelihood improvement, and sustainable development?

Methodology

This study used a mixed-methods descriptive research design, combining quantitative and qualitative techniques to generate robust, triangulated evidence on digital education in Nigeria with a focus on the North-Central zone. The mixed approach enables measurement of infrastructure, connectivity, device access and pedagogical readiness (quantitative), while capturing lived experiences, coping strategies, and local innovations through interviews and focus groups conversations (qualitative) (Creswell & Plano Clark, 2018).

Household and school surveys, structured questionnaires for students and teachers, key informant interviews (KIIs), and focus group discussions (FGDs) approaches were deployed. The data collection were conducted through virtual and physical channels and platforms. National and sub-national education survey reports and administrative datasets (e.g., National Bureau of Statistics ICT and household surveys; Federal Ministry of Education/EMIS state reports; UNESCO GEM and UIS datasets), published diagnostics (World Bank, UNICEF), virtual sources (official ministry portals, NITDA, NBS online repositories), and reputable Nigerian press coverage documenting conflict, displacement and education disruption (e.g., Daily Trust, Premium Times, The Guardian) used to contextualize recent events and timelines. Using credible secondary sources helps situate primary findings in documented trends and provides time-series context (UNESCO, 2023; NBS, 2022; World Bank, 2023).

Study population comprises all the students (upper primary to tertiary) in public and private institutions (including out-of-school and displaced learners in IDP settings), Teachers, school ICT coordinators, and school administrators, Education policymakers and planners at state and LGA levels, Community leaders, NGO/CSO staff engaged in education/peacebuilding, and parents/guardians.

Stratification of North-Central states by conflict exposure and ICT readiness using secondary indicators (EMIS, IDMC displacement data, NBS infrastructure stats). Purposive selection of representative states/LGAs: include at least two conflict-affected LGAs (high displacement/damage), two relatively stable LGAs, and at least one urban cluster. Random sampling within selected LGAs: randomly select schools and households from school lists and enumeration frames; in IDP sites use purposive + snowball sampling to reach displaced learners and returnees. Sample size: quantitatively, estimate sample sizes to achieve adequate power (e.g., minimum $n \approx 400$ –600 households/school respondents across the zone, adjusted for clustering); qualitatively, conduct 20–30 KIIs and 8–12 FGDs purposively distributed across stakeholder groups (Creswell, 2014; Etikan & Bala, 2017). The rationale for this hybrid strategy balances representativeness (random sampling) with in-depth contextual insights where random frames are incomplete (IDP camps, informal learning hubs).

The instruments for data collection are discussed below

- Structured questionnaires for households, CSOs and schools (modules on electricity, device ownership, internet access/cost, learning continuity, and educational expenditures). Questionnaires will adapt validated items from NBS ICT surveys and UNESCO/UIS instruments.
- Teacher survey: digital competence self-assessment, training history, frequency of ICT use in instruction, perceived barriers.
- Key Informant Interview (KII) guides: for state education officers, EMIS managers, NITDA representatives, NGO program leads, exploring policy, financing, and infrastructure rollouts.
- Focus Group Discussion (FGD) guides: for teachers, parents, youth and displaced learners, exploring access challenges, coping strategies, perceptions on digital pedagogy and peace education. The FGD was achieved through virtual and physical channels and platform.

- Document review template: used for systematic extraction of data from secondary sources (EMIS/state reports, NBS household surveys, UNESCO GEM, World Bank diagnostics, and selected newspaper articles documenting specific conflict events and dates).

A rigorous document review conducted include: National Bureau of Statistics ICT and household reports (NBS), Federal Ministry of Education EMIS/state education sector reports, UNESCO GEM/UIS online datasets, World Bank diagnostics, UNICEF Nigeria situation reports, IDMC displacement reports, and archived news reports (Premium Times, Daily Trust, The Guardian) to triangulate timelines of displacement and school destruction that affect learning continuity.

Data collected were analysed using descriptive statistics like frequencies, means, cross-tabulations (e.g., device ownership by urban/rural, displacement status). Inferential analysis like chi-square tests, t-tests, and multivariate regressions to examine associations between infrastructure (connectivity, electricity), household wealth, conflict exposure, and education outcomes (attendance, digital access, learning continuity). Hierarchical (multilevel) models will account for clustering at school/LGA levels when appropriate (Hox, 2010). Qualitative analysis was used through Transcribe KIIs and FGDs; analyse using thematic content analysis (Braun & Clarke, 2006) to identify salient themes (barriers, resilience practices, pedagogical innovations, policy gaps). NVivo or ATLAS was used to manage coding. Triangulation: compare qualitative themes with quantitative patterns and secondary data to validate findings and explain outliers. Secondary data synthesis: Systematic extraction of indicators (internet penetration, school electrification, teacher ICT training) from NBS, UNESCO, and World Bank sources; trend charts and comparative tables will show national vs North-Central status. Newspaper timelines will be used to map major conflict events and correlate with observed school disruptions.

Results

The study's findings, drawn from education survey reports, government statistics, international development datasets, and documented case studies, reveal the realities, challenges, and transformative potentials of digital education in Nigeria, particularly in the North Central zone. The findings are organized thematically below.

Access to Digital Tools and Connectivity: Access to reliable internet, affordable devices, and steady electricity is essential for digital education. However, significant inequalities persist between urban and rural areas. According to the National Bureau of Statistics (NBS, 2023), internet penetration in the North Central region averages 32%, compared to 43% nationally. Smartphone ownership among secondary school students in urban areas is about 57%, while in rural areas, it drops below 35%. Computer/tablet access remains under 15% for most households.

Table 1: Access to Digital Tools and Connectivity in Selected North Central States

State	% Households with Internet Access	% Students with Smartphones	% Students with Computers/Tablets	Avg. Download Speed (Mbps)
Benue	28%	41%	12%	8.4
Kogi	30%	39%	14%	9.1
Niger	35%	44%	15%	10.3
Plateau	33%	46%	16%	9.8
Nasarawa	34%	43%	13%	9.0

Sources: NBS (2023); ITU (2023); NCC (2022);

Percentage of Teachers Trained to Integrate E-Learning Into Pedagogy

Teacher preparedness is a key determinant of effective digital learning. A UNESCO–Federal Ministry of Education survey (2022) found that only 27% of teachers in the North Central states had received formal training in digital pedagogy. The national average stands at 38%, with rural schools showing even lower figures due to infrastructural constraints and limited professional development opportunities.

Table 2: Teachers Trained in Digital Pedagogy (2022)

Region/Zone	Percentage Teachers Trained	Percentage Using LMS in Classrooms
North Central	27%	15%
National Average	38%	22%
Global Average (SSA)	56%	34%

Stakeholder Engagement and Perceptions

Stakeholder involvement in advancing digital education varies widely. Parents, NGOs, and private sector actors play increasing roles in device provision, ICT hubs, and advocacy for inclusive learning. In a 2023 NBS survey, 72% of parents agreed that digital education improves job prospects for their children, but 68% cited affordability of devices and data as major barriers. Local government councils in Nasarawa and Plateau have also partnered with NGOs to set up solar-powered community learning centres in off-grid communities.

Impact of Conflicts on Education, Learners, Educators, and Communities

Conflict-induced displacement and insecurity have severely disrupted education in parts of the North Central zone. In states such as Benue, Nasarawa, and Plateau, herder–farmer clashes and communal violence have led to school closures, teacher displacement, and loss of learning time. According to UNHCR (2023) and the Internal Displacement Monitoring Centre (IDMC, 2023), over 630,000 people were displaced in the region in 2022–2023, many of whom are school-age children.

Table 3: Conflict Impact on Education in North Central Nigeria (2022–2023)

State	Schools Closed	Learners Displaced	Teachers Displaced	Education-related Fatalities	Communities Affected
Benue	84	94,000	1,200	37	112
Plateau	61	72,500	890	29	96
Nasarawa	43	58,000	760	21	74
Niger	35	44,000	510	17	53
Kogi	22	28,500	370	9	39

Sources: UNHCR (2023); IDMC (2023); NEMA (2023)

Notable Innovations, Case Studies, and Transformation in Education and Agriculture

Innovations in the North Central zone highlight how digital education can be leveraged for transformation in education and livelihoods:

- Benue Agro-Digital Initiative (BADI): Integrates e-learning modules on sustainable farming for displaced youth, linking food security and education.
- Plateau e-School Project: Uses solar-powered digital classrooms to deliver offline educational content in rural, conflict-affected areas.
- Nasarawa Mobile ICT Hubs: Mobile vans equipped with laptops and preloaded e-learning content, reaching schools without internet access.
- Agritech for Development: Farmers in Niger State use mobile apps for weather updates, pest control advice, and market price alerts, improving productivity by 18% in pilot communities (FAO, 2023).

Youth Engagement and Capacity Enhancement: Youth-focused programs have enhanced the skills of young people to deploy digital tools for education and socio-economic development. Initiatives such as Youth Digital Champions in Kogi have trained over 1,200 secondary school students in coding, digital storytelling, and mobile app design. FAO and UNICEF joint programs have also targeted digital agriculture skills for 800 displaced youth in Benue and Nasarawa, providing pathways to both learning and income generation.

Discussion of Findings

The first research question of the study focused on assessing the level of access to digital tools, internet connectivity, and electricity across zone. The findings revealed significant disparities in access between urban and rural communities, a pattern that is consistent with recent global assessments on digital inclusion. According to the ITU (2023); ITU,2024, affordability and infrastructure deficits remain the primary barriers to digital adoption across low- and middle-income countries, and this pattern is clearly replicated in the North Central region, where internet penetration averages 32%, far below the national average of 43% (NBS, 2023). Studies by Agarwal et al. (2025), ITU (2025), Dosumu (2024), and the World Bank (2024) affirm that digital inequality in Nigeria is strongly attributed to unreliable broadband, poverty-level household incomes, and irregular power supply, which collectively reduce learners' ability to adequately participate in online education. The documented low access to laptops and tablets, below 16% across states, further reinforces earlier findings by Yeba et al. (2024) and Adade & Biney (2024), who argue that limited device ownership remains a core contributor to digital exclusion. Therefore, the findings clearly support the argument that infrastructural challenges significantly undermine equitable digital education in the region.

The second research question examined the extent of teacher preparedness and the integration of digital pedagogy into classroom practice. The finding that only 27% of teachers in North Central Nigeria are trained in digital pedagogy resonates with UNESCO's Global Education Monitoring Report (2022), which highlights persistent professional development gaps in sub-Saharan Africa. Research by Adedoyin & Soykan (2024) similarly emphasizes that inadequate teacher ICT competence remains a critical barrier to digital transformation in Nigerian schools. The relatively low adoption of Learning Management Systems (LMS) recorded in this study aligns with recent observations by Brian et al. (2024), who argue that teachers' resistance or inability to navigate new technologies is often reinforced by insufficient training, limited school-level technical support, and infrastructural weaknesses. The implications of this are profound, as multiple studies, including Owusu-Boampong (2024), confirm that teacher digital competence directly influences learner engagement, instructional effectiveness, and overall digital learning outcomes. Thus, the findings from this research reinforce the global consensus that digital transformation of education must prioritize the continuous professional development of teachers.

The third research question focused on stakeholder perceptions and engagement in advancing digital education in the region. The study revealed broad parental support for digital learning, with 72% acknowledging its potential to improve children's future job prospects. This finding aligns with recent evidence from the African Development Bank (AfDB, 2023), which notes that households increasingly recognize digital skills as drivers of upward mobility in contemporary labour markets. However, concerns regarding affordability echo arguments by Tella & Oladimeji (2024), who observe that the high cost of smartphones, data bundles, and ICT infrastructure continues to exclude vulnerable households. The involvement of NGOs and private-sector actors in establishing solar-powered learning centres and ICT hubs further validates the assertion by Njoku et al. (2025), that multi-sectoral collaboration is essential to narrowing Africa's digital development gap. The findings therefore support current literature emphasizing that meaningful digital transformation is driven not only by government policy

but also by active participation from communities, development partners, and the private sector.

The fourth research question explored the effects of conflicts on education, especially in the context of the North Central region's protracted insecurity. The data showed high numbers of school closures, displacement of teachers and learners, and education-related fatalities. These findings corroborate UNHCR (2023) and IDMC (2023) reports documenting widespread displacement and severe disruptions to schooling across conflict-affected states. Studies by Uwakwe et al. (2025), Anzaa et al. (2025), and the Global Coalition to Protect Education from Attack (2024) consistently demonstrate that conflict not only reduces children's access to formal learning but also worsens inequalities, increases dropout rates, and undermines community resilience. The study's results further align with Walker & Okechukwu (2024), who argue that persistent conflict erodes education systems by causing infrastructural damage, generating psychological trauma, and weakening teacher availability. The evidence therefore reinforces the argument that conflict remains a central barrier to educational continuity and digital learning expansion in many parts of Nigeria's North Central zone.

The fifth research question examined innovative digital education and Agritech interventions in the region. The identified initiatives, including the Benue Agro-Digital Initiative (BADI), Plateau e-School Project, Nasarawa Mobile ICT Hubs, and Niger agritech pilots, showcase practical efforts to leverage technology for learning and livelihood enhancement. These align with global development recommendations such as those in FAO's Digital Agriculture Report (2023), which emphasizes that integrated digital systems can improve youth employment, agricultural productivity, and community resilience. Similarly, research by Bauman et al. (2024) demonstrates that mobile-based agricultural learning increases access to knowledge and strengthens food security in conflict-affected regions. The findings therefore validate the argument by UNESCO & UNICEF (2024) that digital innovations hold transformative potential when designed to address the intersecting challenges of education, conflict, and livelihoods.

Finally, the sixth research question assessed youth capacity-building and digital empowerment in the zone. The study's findings on youth-focused ICT training initiatives, such as the Youth Digital Champions program and FAO–UNICEF joint digital skills projects, align with recent scholarship underscoring the importance of digital skills for youth socio-economic mobility. According to the World Economic Forum (2024), digital competencies are now central to employability, innovation, and entrepreneurship. Research by Olawale & Nworie (2024) further emphasizes that digital training programs significantly enhance youths' ability to adapt to labour market demands and contribute to community resilience. The study therefore reinforces contemporary literature highlighting that youth-centred digital innovation is a critical pathway for addressing unemployment, strengthening peacebuilding, and driving sustainable development in Nigeria. Taken together, the findings of this research strongly support the argument that while digital education in North Central Nigeria faces considerable infrastructural, socio-economic, and conflict-related barriers, they demonstrate remarkable potential for transformation through strategic investment, stakeholder collaboration, and targeted digital empowerment initiatives. The evidence underscores the urgent need for holistic, multi-sectoral approaches that integrate infrastructure expansion, teacher capacity-building, community engagement, conflict-sensitive programming, and youth empowerment to harness the full potential of digital education for sustainable development.

Conclusion

This study examined the transformative potential of digital education for sustainable development in North Central Nigeria, with emphasis on access, teacher preparedness, stakeholder engagement, conflict dynamics, innovations, and youth capacity. Findings reveal persistent structural barriers: internet penetration remains low at 32%, electricity supply is unreliable, and device ownership is limited, particularly in rural and conflict-affected communities (NBS, 2023). Teacher preparedness is equally constrained, with only 27% of educators trained in digital pedagogy (FME, 2023). While stakeholders generally support digital education, affordability and inclusivity remain key concerns, especially for displaced populations. Conflict further compounds these challenges through school closures, displacement, and high dropout rates (UNHCR, 2023; IDMC, 2023). Nevertheless, localized innovations such as the Benue Agro-Digital Initiative and Plateau e-School Project illustrate pathways for integrating education, agriculture, and peacebuilding. The study concludes that digital education is a cross-sectoral enabler of SDGs 2, 4, 8, and 16, provided systemic constraints are mitigated through coordinated policy, investment, and partnerships.

Recommendations

These recommendations are designed to align with sustainable development and digital inclusion goals.

- Government is encouraged to strengthening infrastructure central to digital education success by expanding rural broadband with targeted subsidies, especially in conflict-affected and underserved area, alongside solar-powered ICT hubs to mitigate unreliable electricity and improve sustainable digital access.
- Ensuring continuous professional development in digital pedagogy in teacher training and in-service programs alongside device-subsidy schemes for educators and relevant community will enhance ownership among teachers and displaced populations. Applying universal design for learning (UDL) principles ensures accessibility for learners with disabilities, enhancing inclusivity across education systems.
- State governments working in collaboration with tech firms to scaling digital education through enhanced digital access will encourage learning resilience mostly for the IDPs and other marginalized persons.

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